it is intended that such changes would still fall within the scope of the present invention. It simply is not practical to describe and claim all possible revisions to the present invention which may be accomplished. To the extent such revisions utilize the essence of the present invention, each naturally fall within the breadth of protection encompassed by this patent. This is particularly true for the present invention since its basic concepts and understandings are fundamental in nature and can be broadly applied.

I claim:

1. A method of providing frequency reuse in a communication system, the method including:
   - receiving a plurality of transmitted signals with a plurality of receiver elements, the receiver elements capable of providing a plurality of received signals having known ratios of co-channel interference,
   - providing the received signals with algebraically unique ratios of co-channel interference, and
   - separating at least one desired signal from the received signals.

2. The method of claim 1 wherein the step of providing the received signals with algebraically unique ratios of co-channel interference includes shaping at least one spatial gain distribution of at least one of the transmitted signals.

3. The method of claim 1 wherein the step of providing the received signals with algebraically unique ratios of co-channel interference includes shaping at least one spatial gain distribution of at least one of the received signals.

4. The method of claim 1 wherein the step of providing the received signals with algebraically unique ratios of co-channel interference includes at least one of a set of methods including aperture synthesis, beam steering, lensing, and interferometric combining.

5. The method of claim 1 wherein the step of providing the received signals with

algebraically unique ratios of co-channel interference is performed in response to a feedback signal from at least one receiver.

6. The method of claim 1 wherein the receiver elements are spatially separated array elements.

7. The method of claim 1 wherein the receiver elements are polarization elements and the co-channel interference includes cross polarization.

8. The method of claim 1 wherein the step of providing the received signals with algebraically unique ratios of co-channel interference includes an optimization step wherein the optimization process controls the step of providing the received signals with algebraically unique ratios of co-channel interference.

9. The method of claim 9 wherein the ratios of co-channel interference result from spatial gain distributions of the received signals.

10. The method of claim 9 wherein the spatial gain distribution includes at least one minima in a predetermined spatial region.

11. The method of claim 9 wherein the spatial gain distribution includes at least one spatial region having at least one predetermined ratio of signal levels.

12. The method of claim 9 wherein the spatial gain distribution is controlled by directionality of the receivers.

13. The method of claim 9 wherein the spatial gain distribution is created by an overlap of at least two transmitted signals.

14. The method of claim 1 wherein the ratios of co-channel interference provide weights to a cancellation step that is included in the step of providing separation of the

transmitted signals from the received signals.

15. The method of claim 14 wherein the weights have complex values.

16. The method of claim 14 wherein at least one of the weights includes a delay element.

17. The method of claim 14 wherein the weights are frequency-dependent weights, the transmission signals having diverse frequency characteristics.

18. The method of claim 14 wherein the weights are frequency-dependent weights and the transmission signals have a plurality of signal frequencies.

19. A method of bandwidth-efficient communications that achieves frequency reuse, the method including:

- transmitting a plurality of transmission signals having at least one common frequency channel,
- receiving the plurality of transmitted signals with a plurality of receiver elements for providing a plurality of received signals, the received signals having known ratios of co-channel interference,
- providing the received signals with algebraically unique ratios of co-channel interference, and
- separating at least one desired signal from the received signals.

20. A method of array processing that enables simultaneous frequency use of a plurality of transmitted signals, the method including steps of:

- determining a plurality of ratios of co-channel interference occuring between the transmitted signals received at each of a plurality of receivers,
- receiving the transmitted signals at the receivers, the receivers capable of being responsive to the received transmitted signals for providing a plurality of received signals, the received signals having known ratios of co-channel interference,
- providing the received signals with algebraically unique ratios of co-channel

interference, and

- separating the transmitted signals from the received signals.

21. A method of bandwidth-efficient communications that achieves frequency reuse, the method including steps of:
    - providing transmission of a plurality of transmission signals having at least one common frequency channel,
    - providing determination of a plurality of ratios of co-channel interference occuring between the transmitted signals received by a plurality of receivers,
    - receiving the transmitted signals with the receivers, the receivers capable of being responsive to the received transmitted signals for providing a plurality of received signals having known ratios of co-channel interference,
    - providing the received signals with algebraically unique ratios of co-channel interference, and
    - providing separation of the transmitted signals from the received signals.

22. A method of optimizing separation of a plurality of transmitted signals received by a plurality of receiver elements coupled to a cancellation circuit, the method including steps of:
    - receiving a plurality of transmission signals transmitted in at least one common frequency channel for providing a plurality of received signals, at least one of the received signals having co-channel interference,
    - providing at least one determination of signal quality for at least one of a plurality of separated signals output by the cancellation circuit,
    - providing at least one feedback signal to at least one transmitter that generates the transmission signals, and
    - adjusting the at least one transmission parameter to provide adjustment to the co-channel interference of at least one received signal, the adjustment of the at least one transmission parameter being related to the value of the feedback signal.

23. A method of separating received transmission signals having known ratios of co-

channel interference, the method including:

- receiving the transmission signals with a plurality of receivers capable of providing a plurality of received signals having known ratios of co-channel interference,
- providing weights to a cancellation circuit based on the ratios of co-channel interference, and
- coupling the received signals into the cancellation circuit, the cancellation circuit being capable of separating the received transmission signals.

24. A Method of determining spatial gain distributions of a plurality of signals received by a plurality of receivers, the method including:

- transmitting at least one known reference signal,
- measuring the at least one reference signal received by each of the receivers for producing a plurality of measurements, and
- determining ratios of co-channel interference from the measurements.

25. In an electromagnetic-wave communication system, a signal canceller capable of separating one or more transmission signals from a plurality of interfering transmission signals received by a receiver, the signal canceller including:

- a frequency filter coupled to the receiver capable of receiving a plurality of the received transmission signals, each of the received signals having an algebraically unique combination of the transmission signals and each of the transmission signals having distributed frequency characteristics, the frequency filter capable of separating each of the received signals into a plurality of received-signal frequency components;
- a plurality of weighting elements coupled to the frequency filter, the weighting elements capable of providing a weight to each of the received-signal frequency components to provide a plurality of weighted received-signal frequency components; and
- a signal combiner capable of summing the weighted received-signal frequency components to separate the received transmission signals.

26. In an electromagnetic-wave communication system, a signal canceller capable of

separating one or more transmission signals from a plurality of interfering transmission signals received by a receiver, the signal canceller including:

- a plurality of weighting elements coupled to the receiver capable of receiving a plurality of receive signals from the receiver, each of the receive signals having an algebraically unique combination of the transmission signals, the weighting elements capable of providing at least one weight to each of the receive signals to provide a plurality of weighted receive signals and
- a signal combiner capable of summing the weighted receive signals to separate the interfering transmission signals.

27. In an electromagnetic-wave communication system capable of using interference cancellation to achieve frequency reuse, a receiver capable of separating a plurality of received transmission signals, the receiver including:

- a plurality of receiver elements capable of sampling the transmission signals, the receiver elements capable of being responsive to the transmission signals for generating a plurality of receive signals wherein each of the receive signals includes an algebraically unique combination of the transmission signals and
- a canceller coupled to the receiver elements capable of separating one or more of the received transmission signals.

28. The receiver of claim 27 wherein the plurality of receiver elements is an antenna array that includes a plurality of antenna-array beam processors, the receive signals being output from each of the processors.

29. In an electromagnetic-wave communication system, a receiver capable of receiving a plurality of algebraically unique proportions of a plurality of differently polarized transmission signals to separate at least one of the received transmission signals, the receiver including:

a plurality of polarized receiver elements capable of having different polarizations, each of the receiver elements capable of having a different responsiveness to the differently polarized transmission signals for generating a

plurality of receive signals wherein each of the receive signals includes an algebraically unique combination of the transmission signals, and

a canceller coupled to the receiver elements capable of receiving the receive signals and separating one or more of the received transmission signals therefrom.